Water Management

We can never stop water pollution entirely. As long as we go on using water in our homes and factories and on our farms, some pollution is inevitable. But we can and must control it, by setting workable standards of water quality and seeing that these are met.

Pollution control is an essential part of sound water management. Such management also includes the regulation of water flows and quantities for domestic use, irrigation, power production and other purposes. Water management must be undertaken on a regional basis; and this includes pollution control.

Experts have developed water quality criteria for five main uses of water: domestic, recreational, biological, agricultural and commercial. Criteria are established in terms of the properties vital to these uses. The highest quality requirements are for domestic water supplies and direct human contact, as in swimming areas. Commercial uses, shipping and hydro-electric power production have lower quality requirements.

We must decide, then, what use is to be made of each water body. With this in mind we can determine minimum standards of water quality. To contaminate and degrade the water below these standards—to make it unsuitable for its best use—would then constitute pollution.

The Challenge Ahead

Controlling water pollution will be no easy job, and we can't expect to do it overnight. The damage caused by many years of abuse will take years to repair, and we may never restore all our waters to their original purity. But, with careful water management, we can turn the tide against pollution within this decade.

Rolling back water pollution will cost us money, too—possibly five billion dollars over the next 10 years. Besides enforcing laws and regulations, we'll have to build new and more efficient sewage-treatment systems. Industry, too, will have to spend millions to treat its own wastes. And all of us will have to bear the cost, through our taxes or through the prices we pay as consumers.

Sound water management is one of the wisest investments we can make. It will pay rich dividends in cleaner water and a better, safer and more pleasant Canada. On the other hand, hesitating now to move against pollution could cost us dearly later on.

Who is Responsible?

Taking a simplified view of Canada's constitution, it may be said that our water resources belong to the provinces. But the federal government and the provinces all have legislative authority over various aspects of water use. Working closely with the provinces, the federal Department of the Environment is providing leadership in the war on pollution.

Vital to that leadership is the water research conducted by its scientists, engineers and other experts. At Burlington, Ontario, the department operates one of its major scientific establishments—the Canada Centre for Inland Waters. Bedford Institute on the East Coast, the Fresh Water Institute at Winnipeg and several Pacific Coast establishments are focuses for a great variety of research being done on water and things related to it.

Along our Southern border we cooperate closely with our American neighbors in solving our water problems. Coordinating our efforts is the International Joint Commission, with members appointed by the Canadian and United States governments. Recommendations made by the IJC have been adopted by the two countries, to speed purification of our water.

To fight pollution, though, we don't have to be politicians, industrial leaders, scientists or engineers. Whether we act as individuals or as members of some organized group, there's a job for every one of us.

WHAT *YOU* CAN DO ABOUT WATER POLLUTION

1. Don't cause needless pollution yourself. Don't use lakes, streams or sewers to dispose of toxic chemicals like weed-killers and insecticides, fertilizers, oil, paint or other insoluble wastes.
2. Teach your children and encourage your neighbors to follow your good example in safely disposing of wastes. Insist that conservation and pollution studies be included in the curriculum of your local schools.
3. Urge and support the enactment of effective laws and by-laws to control water pollution. Write to your local newspaper and your elected representative about this.
4. Help to enforce anti-pollution laws by reporting violations to police, local health officials or other pollution-control agencies.
5. Press for the construction of adequate sewage-treatment facilities in your community. Be ready to support this with your voice, your ballot and your money.
6. Don't overlook the need for pollution control where you spend your summers and vacations. Push for adequate regulations and other measures there.
7. If you own a cottage, make sure it has a well-designed and properly installed septic tank. Make sure you understand its proper care and operation.
8. If you own or operate a pleasure boat, make sure wastes are retained in a proper holding tank and, when taken ashore, see that they are disposed of through proper sanitary methods.
9. If you own or operate a farm, control soil erosion and the run-off of wastes from feed lots and trash heaps. Arrange for the proper disposal of animal wastes. Avoid the excessive or improper use of herbicides, pesticides and fertilizers.
10. If you are a builder or developer, prevent silt and debris from washing off construction sites into lakes or streams. Make pollution control a normal part of your operations.
11. If you are a manufacturer or a merchant, make sure your product or its packaging doesn't contribute to needless pollution. If it does, take action to eliminate this nuisance.
12. Speak out against water pollution. Join local organizations concerned with fighting pollution. Urge service clubs, labor unions, your local chamber of commerce and other groups to take up the same fight.
13. Write to industrial leaders reminding them of their obligations as good citizens. Encourage them to clean up the wastes from their plants and factories. Ask them to improve their products to reduce pollution hazards—for example, by producing detergents without phosphates.
14. Wherever you find good water management, whether by public agencies or by private industry, let people know about it. Every effective job shows what can be done, and serves as a spur to others if they hear about it. So make sure they do.

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Issued under the authority of the Honourable Jack Davis, P.C., M.P., Minister, Environment Canada

don't take water for granted

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Environment Canada / Environnement Canada
Water Management / Gestion des Eaux

L. Edgeworth, Assistant Deputy Minister,

Essential to life, water is one of the earth's most abundant substances. We find it almost everywhere—in the sky, on the ground and underneath it, as a liquid, a solid and a gas. But you won't find pure water anywhere in nature.

Chemically pure water, as produced in a laboratory, is H_2O—two atoms of hydrogen and one of oxygen. But water carries and dissolves so many other substances that we often call it the universal solvent. Does this mean that all the water in our streams, lakes and oceans is polluted? That depends on what we mean by pollution. And this, in turn, depends on what we want from the water.

Anyone who has tasted chemically pure water will agree that it is tasteless and flat. So "good-tasting" water has something more in it besides hydrogen and oxygen—usually mineral salts. Dissolved in it, too, is additional oxygen which fish need to breathe.

Water is polluted, then, when impurities interfere with our use and enjoyment of it. Viewed in this way, even heat can be a form of pollution. For brook trout, a stream is polluted if the water temperature rises above 70 degrees Fahrenheit—even though it may otherwise be quite pure. For many industrial uses it is polluted if its temperature rises above the point at which it loses its efficiency as an absorber of heat. For domestic water supplies it is polluted if algae or chemical substances produce an objectionable taste. And for human contact it is polluted if it contains more than 10,000 coliform bacteria per quart.

Water, the Servant

Plant life, on which we all depend for food, requires water for two essential functions—to maintain cell structure and to supply nutrients obtained from rocks, minerals and other substances.

Water has other important properties, as well. Its heat capacity is very high. That means a great deal of heat is required to raise its temperature even a few degrees; and conversely, it releases large quantities of heat as it cools. This gives large bodies of water enormous power to influence the weather—making summers cooler and winters milder. It also makes water an effective heat carrier in homes, factories and offices.

Other important properties of water are its ability to dissolve other materials and its high specific gravity. Together these enable it to carry large amounts of matter in solution and suspension. In this manner, water is used to remove vast quantities of solid wastes from homes and industrial plants.

Natural Contamination

The widespread use of water for waste removal is a major cause of water pollution. But it is far from the only one. Contamination begins in the atmosphere, in the condensation stage of the hydrologic cycle—the endless movement of water from the ocean to the atmosphere, to the land and back again to the ocean. Water vapor condenses to form cloud droplets around particles of dust or salt. As the droplets grow and fall they accumulate more particles and gases.

After striking the earth, each droplet—unless it evaporates very quickly—either joins a stream or river bound for the ocean, or it percolates into the soil. From there on it may feed plants or it may become groundwater. As it moves along it dissolves minerals from surface soil or underground rocks. It may also pick up suspended soil minerals and organic matter from plant and animal growth; thus when it emerges into lakes and streams it becomes the habitat of living things, including microscopic floating plants of many different kinds and shapes, known as phytoplankton. These are eaten by tiny animals called zooplankton, which in turn serve as food for fish. The abundance and variety of these organisms depend on the chemical and organic plant nutrients in the water. Some of these nutrients—especially phosphorus and nitrogen—can create a serious pollution problem.

Groundwater can be seriously contaminated from natural causes. It varies in quality from nearly pure to highly mineralized or saline. Some groundwater is useless for irrigation because of its high concentration of undesirable or harmful salts. It may be undrinkable or highly laxative.

Man-made Pollution

But man himself is responsible for most water pollution in settled territory. The causes are many and ever-increasing. The main hazards are from household sewage, industrial wastes and run-off carrying eroded soil or leached materials, including pesticides and nitrates.

Even today, household sewage—principally garbage and human wastes—can cause dangerous and costly epidemics. As it decays, moreover, it produces foul odors; and, when dumped untreated into a water course, uses up dissolved oxygen needed by fish. Nowadays, too, sewage is heavily loaded with troublesome phosphates, mostly from detergents.

Phosphates act as a fertilizer for weeds and algae, which include the phytoplankton already mentioned. Some such growth is necessary to support fish and other aquatic life, but excessive growth can stifle our lakes and streams. The over-enrichment of our waters with phosphates and other plant nutrients is known as eutrophication—a serious form of pollution.

Algae now form slimy green carpets on many water bodies, fouling beaches, swimming areas and domestic water supplies. As they die and decay, they rob the water of oxygen. This can make it unsuitable for desirable types of fish.

Industrial wastes include phosphates, along with harmful chemicals such as arsenic, cyanides and sulphuric acid. Phenols and other substances produce unpleasant tastes and odors in our drinking water. Oil threatens fish and waterfowl, besides spoiling water and beaches for human use.

Decaying refuse from canneries, cheese factories and other food-processing plants uses up oxygen, just like sewage and decaying algae. So do wood fibre, bark and similar wastes from pulp and paper mills. The heating of water in industrial processes drives out oxygen and other dissolved gases, making it less able to support life.

Farm runoff includes animal wastes and fertilizers—largely phosphates and nitrates—which worsen the algae nuisance. Meanwhile, pesticides washed into the water can destroy fish and wildlife.

Foam and Phosphates

Until recently, detergents contained a foaming ingredient that wouldn't break down under sewage treatment or other bacterial action. Consequently this ingredient—known to chemists as alkyl benzene sulphonate—produced unsightly suds in our lakes and rivers. But in 1966 it was replaced in so-called "biodegradable" detergents, by a new foaming substance that decomposes readily—linear alkylate sulphonate.

Unfortunately the detergents still contained a phosphate—usually a sodium salt, sodium tripoly-phosphate.

The search still goes on for a practical substitute, along with ways of removing phosphates from waste water. Like nitrates and many other substances, phosphates are largely unaffected by ordinary sewage treatment, more effective means of treatment are now being developed.

Many Answers Being Sought

We need continuing research into water problems, including pollution. How, for example, is water affected by the many new products that come on the market each year? How can we produce safe, yet effective detergents that do not contain phosphates? And how can we improve our present methods of treating sewage?

Many communities still pour untreated sewage into our rivers, lakes and coastal waters. Many others have sewage-treatment systems that are either badly overloaded or provide inadequate treatment of certain wastes. Some sewage-disposal plants provide only first-stage or primary treatment. This removes some of the solids by screening or settling, but leaves other wastes untreated—except, perhaps, by chlorination. Secondary treatment puts bacteria and other micro-organisms to work on these remaining wastes. This removes most of the finer solids and dissolved organic matter, producing a relatively pure, high-quality waste water.

But neither primary nor conventional secondary treatment has much effect on phosphates. To remove these, scientists and engineers are trying to devise an efficient third-stage or tertiary form of treatment. But more research is needed here. More research is needed, too, into the safe and efficient disposal of many industrial wastes.